

Conserving and increasing biodiversity in the large-scale, intensive farming systems of the Western Cape, South Africa

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Biodiversity conservation in the Western Cape

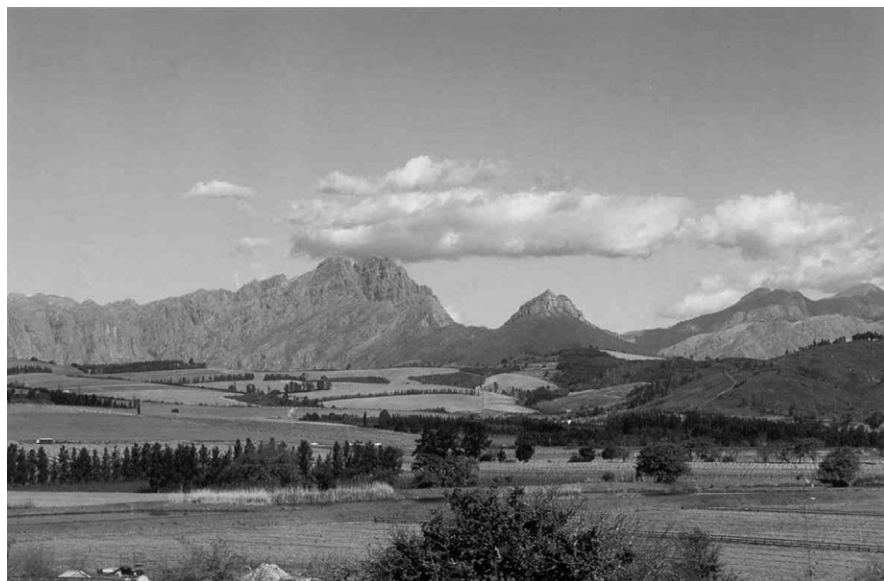
The most productive farmlands in the Western Cape are situated in what is known as the Cape Floristic Region (CFR), an area of approximately 90 000 km² at the southwestern tip of Africa and one of the world's richest regions in terms of botanical diversity.² Approximately 9000 species of vascular plants are found here, of which about 70% are endemic. Of these, 1406 are Red Data Book species, the highest known concentration of threatened and rare species in the world.³ A major threat to these species is habitat transformation through cultivation for agriculture. A recent study showed that almost 26% of the CFR is currently transformed by agriculture, while urbanization and alien plant invasion contribute another 1.6% each.⁴ This may seem relatively low and no reason for concern, until it is realized that the percentage of untransformed land is inflated by large areas that are mountainous or too dry for intensive agriculture. If the 16 primary and 87 secondary Broad Habitat Units (BHUs) into which Cowling and Heijnes⁵ divided the CFR are examined individually, it appears that 80% of the primary BHUs called Coastal Renosterveld has been cultivated (covering approximately 14 000 km²), where most of the wheat fields and the vineyards of the Western Cape are found. For two of the secondary BHUs of this 14 000 km² area, namely Swartland and Overberg Coastal Renosterveld, it rises to about 88% and 94%, respectively.⁶ Similarly, the Elgin subunit of the Fynbos/Renosterveld Mosaic BHU (136 km²), where mostly apples are grown, is 86% cultivated.⁴ Apart from the plants, the

The Convention on Biological Diversity, adopted in 1992 in Nairobi and signed by many states, including South Africa, at the United Nations Conference on Environment and Development in Rio de Janeiro later that year, urges nations to conserve biological diversity. This places a special responsibility on farmers, who own most of the land. Yet agricultural practices usually aim at simplifying ecosystems in favour of the crops (and animals) that are produced. In the Western Cape province of South Africa, this process has resulted in extensive monocultures of wheat, grapevines and fruit trees. The questions arise: should farmers bring more biodiversity back into these systems and, if so, how can they do it? Apart from the moral obligation to do so, perceived benefits include the possibility of greater economic and ecological stability, especially under conditions of global climate change; enhanced aesthetic appeal and greater acceptance of farming practices by the public in general and purchasers of farm produce in particular. Possible disadvantages are short-term losses in productivity and profitability. Measures that will contribute towards increasing biodiversity include: intercropping; the planting and maintenance of shelter belts, buffer strips and natural corridors; retaining riparian and other areas of high value natural vegetation; making dams attractive to wildlife; reducing the impact of pesticides; educating farmers and farm workers about the values of biodiversity conservation; and providing financial incentives to landowners for biodiversity conservation. An overview is provided in this paper of current international and national biodiversity conservation policies and programmes and some of the local initiatives that are active in the Western Cape to protect and re-establish biodiversity.

Introduction

Together with the prospect of global climate change, the loss of biodiversity is arguably the most pressing environmental problem of our time. It has become clear that the world is rapidly losing its biological wealth as human activities such as polluting, habitat destruction and invasion by alien plants and animals escalate, and threaten the continued existence of many species and the functioning of eco-

systems. The international concern for the conservation of biodiversity resulted in negotiations leading to the United Nations Convention on Biological Diversity, which was opened for signature at the United Nations Conference on Environment and Development held at Rio de Janeiro in 1992. South Africa ratified the convention in 1995 and followed it up with the National Environment Management: Biodiversity Act (No. 10 of 2004). In terms of this act, the South African National Biodiversity Institute (SANBI) has been established, which is charged with monitoring the status of the country's biodiversity, the conservation status of all listed threatened or protected species, and the status of all listed invasive species. In view of these international and national policies and actions to address biodiversity conservation, this paper focuses on the benefits of biodiversity to farming systems, steps being taken in the Western Cape province of South Africa to conserve biodiversity and, in particular, on the role of the farming community, who owns most of the land, including 80% by area of the most scarce and threatened vegetation types in South Africa.¹



The Cape landscape is characterized by extensive agricultural monocultures amongst patches of natural vegetation, with low and high biodiversity, respectively.

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CFR has lost a great deal of its animal life, particularly the larger mammals that once roamed the grassy lowlands. One mammal species, the bluebuck, has become extinct and another 10 regionally extinct, although some have been reintroduced.⁷ Eight bird species have become regionally extinct since European settlement.⁸

From these facts it should be clear why the CFR is considered a global biodiversity hotspot, which is defined as an area featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat.⁹

Over the years, some areas in the CFR have received some form of 'protected area' status and today national, provincial, local authority and private nature reserves comprise more than 20% of the total area.^{10,11} However, these conservation areas are not representative of the biodiversity patterns or processes that generate them, but skewed towards land with a low value for agriculture (such as mountainous and rocky areas), where the opportunity costs for conservation are low and there is little threat of transformation.⁴ It is therefore important that in any conservation strategy for the CFR, particular attention should be given to the privately owned fragments of natural vegetation still remaining in the lowland regions with high agricultural potential.¹²

Benefits of biodiversity to Western Cape farming systems

Biodiversity conservation is not only about species conservation, but also about the conservation of the genetic variation within species and the habitats or ecosystems within which they occur. For the indigenous or exotic plants and animals that are directly or indirectly involved in the raising of crops and livestock on farms (agro-ecosystems), the term agro-biodiversity can be used.¹³ The most prominent characteristic of agro-ecosystems is their high degree of biotic simplification,¹⁴ which refers to the reduction in species numbers. In the wheat, wine and fruit production systems of the Western Cape, this has reached such an extreme degree that biodiversity in all its dimensions is severely depleted. While the economic benefits, particularly to the individual farmer, of these conversions are obvious, the costs to society of the loss in biodiversity are impossible to quantify. Ehrenfeld,¹⁵ as quoted by Gollin and Smale,¹⁶ gives three reasons why this is so. First, there is a lack of adequate biological knowledge about the functions of genes, species and ecological communities. Second, it is difficult to put values on such

intangible benefits as the satisfaction that people derive from the continued existence of pristine environments; and third, the utilitarian principle underlying economic evaluations is inherently inadequate in valuing the natural world.

Globally, the benefits to agriculture of maintaining natural biodiversity include the following:

- (i) Plant breeders, by applying traditional or new technologies, can transfer desirable traits (such as disease or drought resistance) in related and unrelated 'wild' plants to existing or new crop plants, thereby increasing their productivity and potential to provide a higher income to the farmer and food to consumers.
- (ii) 'Wild' plants are a potential source of new crops for food, oils, medicines, fibres, etc.
- (iii) Natural habitats are a source of natural enemies that can be used for the biological control of pests and diseases.
- (iv) Maintenance of ecological processes that agricultural systems largely depend on, such as soil formation, nutrient cycling, erosion control, water storage, pollination, etc.

These benefits, except (iv), are not experienced to any significant degree by the fruit, vine and wheat farmers of the Western Cape, where only small remnants of the original vegetation and wildlife remain.

However, increasing agro-biodiversity on the individual farm level in the intensive Western Cape farming systems can have the following benefits:

- (i) The risk of 'having all the eggs in one basket' is reduced. Changes in product prices due to fluctuating currency values, consumer preferences and global market conditions, together with climate variation and uncontrollable pests or diseases, can have devastating effects when single crops and single cultivars are grown. This was the case when grape phylloxera wiped out most of the vines in the Cape (as in Europe) in the 1880s and was brought home to the apple farmers in recent years when export prices for their products dropped significantly, putting some of them out of business. Some farming practices are complementary, such as wheat and sheep production, and combining them reduces market vulnerability. However, when all goes well, more profits can be made by a monoculture of the most lucrative crop or variety. This is the trade-off on which the farmer has to base

his decision on what to produce.

- (ii) There is growing evidence that by increasing agro-biodiversity on a farm, pest populations are stabilized and the need for insecticide applications reduced.^{16,17} This can be achieved not only by planting a mixture of crops, but also by adding buffer strips and windbreaks that tolerate or promote non-crop plants where they do not compete with the crop and maintain natural vegetation on the edges of crops. In this way, barriers are created to inoculum or insect pest movement as well as refugia where natural enemies can maintain themselves on pest hosts. However, one negative aspect of increasing biodiversity on farms that produce crops for export is that it increases the likelihood of endemic insects being discovered on the exported products, which may result in consignments being rejected (K.L. Pringle, Department of Conservation Ecology and Entomology, University of Stellenbosch, pers. comm.).

Conservation of fragmented ecosystems on Western Cape farms

Approximately 18 000 renosterveld fragments remain, more than half of which are smaller than a hectare.⁶ These fragments are found mostly along river courses, steep slopes, road reserves and on less productive land. The question should be raised: are these highly fragmented natural areas worth conserving and what is the minimum fragment size for ecological viability? Studies have shown that the composition and diversity of the vegetation on fragments of 4 ha or more in size for fynbos¹⁹ and less than 1 ha for renosterveld²⁰ were not substantially different from that of nearby larger areas, in the latter case despite disturbance by grazing, trampling, crop spraying and frequent fires. One of the explanations offered for the weak fragmentation effect of renosterveld is that most of the species are resprouters and have wind-dispersed seeds.²⁰ Many of the 1500 species of geophytes in the CFR survive today in these remnants, although a number have become extremely rare, such as some of the very attractive *Morea*²¹ and *Aristea* species whose survival depends on a few hectares of land remaining untransformed. Similarly, many other rare plant species can be maintained in the thousands of remaining 'pocket-handkerchief' patches, provided they are managed to retain the disturbance regimes.¹⁰

The role of the small fragments in

supporting animal life is less well documented. In a study on the insect pollinators in such fragments,²² it was found that overall richness of bees, flies and butterflies did not vary significantly between smaller and larger fragments of renosterveld shrublands. However, the abundance of particular species of bees and monkey beetles was significantly affected by fragment size. One orchid species produced no fruits in small fragments and in another plant species fruit set was significantly reduced in fragments that were farther from bigger natural areas, indicating that the long-term survival of some plant species may be affected by fragmentation. This may be because the critical threshold of resources required by certain pollinators may not be available in smaller patches.²² Many other insects, as well as amphibians, reptiles, birds, and small mammals (even small predators) are likely to survive in the fragments if they are properly maintained and managed.

In the case of the deciduous fruit farms in the Elgin district, the number of bird species increased after fruit farming started.²³ This is attributed to the increase in new waterbird habitats as a result of the construction of storage dams for the irrigation of the orchards. However, six species that occurred in the adjacent natural vegetation were absent from the orchards. The study also showed that more species were recorded in an orchard with islands of natural vegetation amongst the blocks than in one without.²³

Implementing biodiversity conservation measures

In view of the importance of the remaining fragments for biodiversity conservation, the first priority should be to ensure that they are not further diminished. The question therefore is: what measures or programmes are in place or can be taken to conserve them? The increasing global concern about biodiversity depletion and growing awareness of the plight of the CFR led to the development of the Cape Action Plan for the Environment (CAPE), later changed to Cape Action for People and the Environment. This comprehensive programme started with an initial grant from the Global Environment Facility in 1998 and is sustained by further grants from this body and the Critical Ecosystems Partnership Fund. The objectives of the programme are: (i) to establish an effective reserve network in the CFR, enhance off-reserve conservation and support bioregional planning; (ii) to develop methods to ensure sustainable

yields, promote compliance with laws, integrate biodiversity concerns into catchment management and promote sustainable nature-based tourism; and (iii) to strengthen institutions, policies and laws, enhance cooperative governance and community participation.²⁴ With the building of partnerships between the stakeholders, it is hoped to ensure that the long-term social sustainability of plans matches the efforts towards ecological sustainability.²⁵ Ultimately, the strategy will succeed only if the general public, and particularly the landowners, develop a sense of pride in biodiversity conservation (an ethical motivation) or if they can be convinced that they benefit directly or indirectly from it (an economic motivation).

In terms of the regulations promulgated in 1997 under the Environment Conservation Act (No. 73 of 1989), a compulsory environmental impact assessment is required for the change in land use from grazing to any other form of agriculture. Furthermore, a ploughing permit must be obtained from the National Department of Agriculture before virgin land (older than 10 years) is developed (Conservation of Agricultural Resources Act, No. 43 of 1983). It is the author's impression that farmers often do not abide by these regulations when small pieces of land are involved and that they are seldom prosecuted when contravening this law. The problem of illegal ploughing also stems either from landowners' ignorance of laws that oblige them to apply for an EIA application or ploughing permit, or due to the lengthy permit approval process that frustrates many farmers.²⁶

In addition to education of landowners and their workers, and the provision of technical assistance and extension information by the national and provincial departments of agriculture, conservation agencies, universities and NGOs, the ultimate requirement is financial incentives. In a survey of landowners who owned Coastal Overberg Renosterveld, 93% of those interviewed considered that offering landowner incentives is a good idea for promoting conservation on private land.¹² One major financial incentive has already been introduced into the new Property Rates Act (No. 6 of 2004), which came into effect on 1 July 2005. In terms of this bill, land rates will in future be levied on all land, but provision is made for rates exclusion on privately owned areas of high conservation value that receive protected area status in terms of the Protected Areas Act (No. 57 of 2003) and are properly managed. In Britain, the

Ministry of Agriculture, Fisheries and Food operates several agri-environment schemes in which farmers are compensated for loss of income if they adopt less intensive, low-input practices that benefit biodiversity conservation within agricultural landscapes.²⁷ In South Africa, this powerful incentive would only be possible with funding from external sources.

In the case of South African producers of deciduous fruit, compliance with the requirements of the Capespan Integrated Crop Management certification system gives them a competitive advantage in global export markets. Some of these markets demand that the fruit they buy is produced in an 'environmentally friendly' way. One of the requirements for certification is an Environmental Management Plan for the farm, in which steps to increase biodiversity should be specified.²⁸ There are presently no guidelines available on what farmers can do to achieve this, but they may include actions such as making irrigation dams 'fish and bird friendly' (by providing shallow areas for vegetation and islands with trees), what to plant in wind breaks, and so on. Similarly, wine producers that comply with the sustainable production guidelines of the Integrated Production of Wine (IPW) scheme, receive an annual certificate. This certificate is not only a prerequisite for producers' grapes to be accepted at many of the larger co-operative wineries, but also for major buyers of wine and export markets. In both the Capespan and IPW schemes, producers who practise integrated pest management and avoid the use of harmful chemicals score highly. This approach to pest control in itself would favour biodiversity conservation. In these biodiversity guidelines within the broader IPW scheme, retention and management of natural habitats on farms and corridors and buffer strips of indigenous plants are recommended. In addition, 37 vine growers had become accredited members of the Biodiversity and Wine Initiative (BWI) by the end of 2005, and amongst them conserve 16 905 ha of pristine natural vegetation.²⁹ The Biodiversity and Wine Initiative is a partnership between the conservation sector and wine industry to minimize the further loss of threatened natural habitat and contribute to sustainable wine production with benefits for both biodiversity conservation and the wine industry.³⁰

One hopes that these initiatives, together with CAPE, will make landowners more aware of the value of fragments of natural vegetation, as awareness levels

are currently low. A survey of landowner attitudes showed that 53% of farmers interviewed did not know that renosterveld was a threatened vegetation type and 58% regarded the fragments as non-productive wasteland.¹² Particular efforts should therefore be made to bring the need for biodiversity conservation to the attention of the wheat farmers, who own most of the fragments but lack the incentives that are changing the attitudes and practices of the producers of exported crops such as fruit and wine.

In addition to conserving what diversity is left, attention should be given to the rehabilitation of marginal land that has gone out of production. If merely left alone, such ploughed and fertilized land can take more than a hundred years to recover to the natural state, as can be seen from the abandoned vineyards on the hills above Coetzenburg, Stellenbosch (personal observations). Enhancing the process requires active treatment of the soil, removal of weeds and reseedling, as is now being attempted with the San project near Darling. Furthermore, the practicality of wheat, vine and fruit farmers establishing biodiversity corridors of indigenous vegetation along roads, fences, rivers and other areas should be investigated and encouraged. These corridors could serve as refuges for predatory insects that would contribute to the biological control of wheat aphids, as was found in England.³¹ In Europe various methods to enhance biodiversity at the edges of farmers' fields have been introduced, leaving strips for natural regeneration and sowing wild-flower mixtures.³² The implications and feasibility of establishing these semi-natural areas on the disturbed, fertilized soil along the wheat fields and vineyards of the Western Cape are subjects for future research. Combating weeds would probably be a major problem.

Casting an idealistic view on the future, one foresees farmers that are aware of the beauty and value of the plants and associated wildlife of the Cape Floristic Region, retain what is left, use agricultural practices that conserve biodiversity and

derive cultural and economic benefits from this agro-ecological approach.

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